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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,442	03/09/2004	Mark T. Swihart	19226/2282 (R-5782)	1817

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EXAMINER


SARKAR, ASOK K

ART UNIT PAPER NUMBER

2891

DATE MAILED: 12/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/796,442	<b>Applicant(s)</b> SWIHART ET AL.	
	<b>Examiner</b> Asok K. Sarkar	<b>Art Unit</b> 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 01 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-27 is/are allowed.
- 6) ☒ Claim(s) 28-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 28 – 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Seraphin, "Influence Of Nanostructure Size On The Luminescence Behavior Of Silicon Nanoparticles Thin Films," J. Mater. Res., Vol. 12(12), p 3386 (1997).

Regarding claims 28 and 29, Seraphin teaches that acid etching of silicon nanoparticles with a hydrofluoric acid and nitric acid solution can be used for the benefit of shifting the luminescent peak in the abstract of their article in page 3386.

Regarding claim 30, Seraphin teaches the acid solution comprises about 0.5% to 20% hydrofluoric acid and about 10% to 40% nitric acid in column 1 of page 3387 under the heading "Experimental Apparatus".

Regarding claims 31 – 33, Seraphin teaches treating the photoluminescent silicon nanoparticles with an oxidizer such as 20 - 40% nitric acid solution under conditions effective to achieve particle surface oxidation in column 1 of page 3387 under the heading "Experimental Apparatus".

Claim 36 is rejected under 35 U.S.C. 102(b) as being anticipated by Bocarsly, "Surface - Chemical Control Of Optical Quenching Process At Porous Silicon Interfaces: Generation of a stable - selective Sulfur - Dioxide Sensor," Abstract of Paper presented in ACS National meetings, March (2000).

Bocarsly teaches forming the Si/SiO<sub>x</sub> interface in water which will provide the Si – OH terminated surface on silicon nanoparticles which in turn is modified with silylfluorocarbon to provide the particle surface silanization.

3. Claim 35 is rejected under 35 U.S.C. 102(e) as being anticipated by Korgel, US 6,846,565.

Korgel teaches a process for stabilizing photoluminescence of silicon nanoparticles comprising treating photoluminescent silicon nanoparticles under conditions effective to produce photoluminescent silicon nanoparticles having a Si – H terminated surface and treating the Si – H surface – terminated nanoparticles (see column 8, line 44) under conditions effective to achieve particle surface hydrosilylation in descriptions in column 1, lines 33 – 57 and column 8, lines 8 – 14. The Si – H terminated nanoparticle surfaces are created by the hydrogen bonding which in turn is capped by hydrosilyl ligand.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Seraphin, "Influence Of Nanostructure Size On The Luminescence Behavior Of Silicon Nanoparticles Thin Films," J. Mater. Res., Vol. 12(12), p 3386 (1997).

Seraphin fails to teach oxidizer is 30% nitric acid solution.

However, it would have been obvious to one with ordinary skill in the art at the time of the invention to judiciously adjust and control the concentration of the HNO<sub>3</sub> solution through routine experimentation and optimization to achieve optimum benefits (see MPEP 2144.05) because the size of the particles can be controlled by the

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oxidation of the particles with  $\text{HNO}_3$ . Oxidation rate is dependent on the strength of the acid and dipping time.

***Allowable Subject Matter***

8. Claims 1 – 27 are allowed.

9. The following is an examiner's statement of reasons for allowance:

Claims 1 – 26 recite, inter alia, a process for producing photoluminescent silicon nanoparticles comprising reacting a silicon precursor in the presence of a sheath gas with heat from a radiation beam under conditions effective to produce silicon nanoparticles and acid etching the silicon nanoparticles under conditions effective to produce photoluminescent silicon nanoparticles. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

Claim 27 recites, inter alia, a process for producing photoluminescent silicon nanoparticles comprising thermally decomposing a silicon precursor in the presence of a sheath gas with  $\text{CO}_2$  laser radiation under conditions effective to produce silicon nanoparticles and acid etching the silicon nanoparticles with a hydrofluoric acid and nitric acid solution under conditions effective to produce photoluminescent silicon nanoparticles. The art of record does not disclose or anticipate the above limitation in combination with other claim elements nor would it be obvious to modify the art of record so as to form a device including the above limitation.

***Conclusion***

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10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 571 272 1970. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on 571 272 1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Asok K. Sarkar  
December 23, 2005

Primary Examiner